Abstract Submitted
for the CAL09 Meeting of
The American Physical Society

Numerical Calculation of Anelastic Seismic Pulse Propagation in a Hysteretic Elastic Material Along a Horizontal Surface Boundary of the Earth DAN KOSIK, Butler University — The stress-strain relation for materials such as soil and sand exhibit hysteretic elastic behavior and are modeled using the Preisach-Mayergoyz method for a numerical calculation of a propagating seismic pulse. The source pulse is taken to be the result of pressure applied to the inner surface of a cylindrical cavity in order to simulate a two dimensional dynamite source. The anelastic differential equation of motion that is solved does not include traditional nonlinear elasticity terms appropriate to materials with atomic elasticity, but contains the dominant anelastic terms appropriate to consolidated materials that exhibit hysteretic elastic behavior. For parameters characteristic of sand at the Earth's surface, a comparison of anelastic to linear seismic pulse propagation gives an anelastic pulse with much slower propagation speed than a corresponding linear pulse with evidence of dispersion in the pulse. The simulated ground roll that results shows dramatic differences between the anelastic and linear cases. These results have important implications for the detailed behavior of strong seismic waves moving in soft sediments. Their dominant frequencies, amplitudes, and methods by which they may be attenuated will depend on getting the detailed pulse structure and its propagation correct.

Dan Kosik
Butler University

Date submitted: 08 Sep 2009 Electronic form version 1.4